NASA TECH BRIEF
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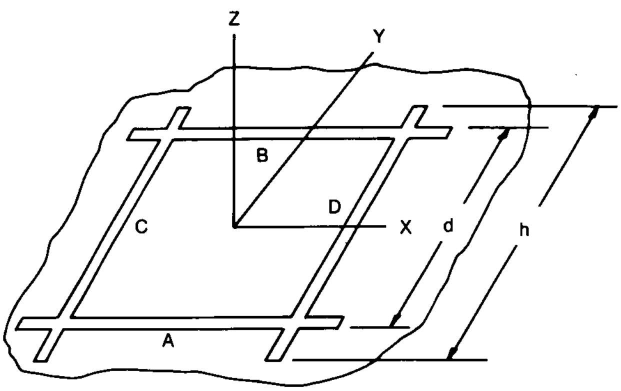
Improved Circulary Polarized Antenna

The problem:

Circularly polarized antennas are made using either a crossed-slot configuration or an equiangular spiral design. Both have some limitations. For example, crossed-slot antennas cannot provide circularly polarized beams over wide angles. Equiangular spiral antennas, on the other hand, have that capability but require expensive modifications.

The solution:

A new circularly polarized antenna can be converted from a narrow beam to a wide beam and vice versa without expensive modifications.



(a)

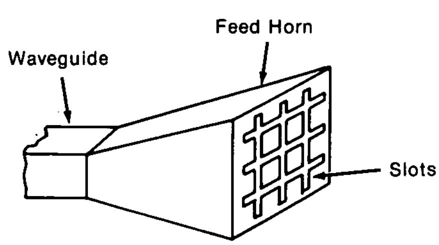


Figure 1. Slot Configuration:
(a) Magnified View and
(b) Mounted on a Feed Horn

How it's done:

The new antenna includes two sets of linearly polarized elements. Each set contains slots in a parallel array. The sets are mutually orthogonal and are driven in phase quadrature. By changing the lengths of the slots or their separations, the antenna beamwidth can be easily changed over a wide range. Similar results are achieved with a dipole configuration.

Shown in Figure 1(a) are two sets of mutually-orthogonal slot elements, A, B and C, D. The distance between a parallel pair is designated as d and the length of each slot is designated as h. In operation, elements A and B are excited in phase with each other. The same situation holds for element C and D. As a combination, A, B are excited in phase quadrature (90°) with C, D to produce a circularly polarized beam.

A complete slot array is shown on a feed horn in Figure 1(b). This configuration provides a relatively narrow beam. When the slots are made shorter so that they do not intersect, a wide antenna beam results. Slot separations can also be varied to produce the same effect. Thus feed horns with different slot configurations are used to produce desired beamwidths.

Figure 2 illustrates a dipole configuration used to form a circularly polarized beam. Here a 90° hybrid is used to split the incoming signal into phase quadrature signals. The signals are applied to the two power dividers. Each divider feeds a parallel pair of dipole elements. As in the slot configuration, the distance between the parallel elements and the lengths of the dipole elements determine the width of the circularly polarized beam.

(continued overleaf)

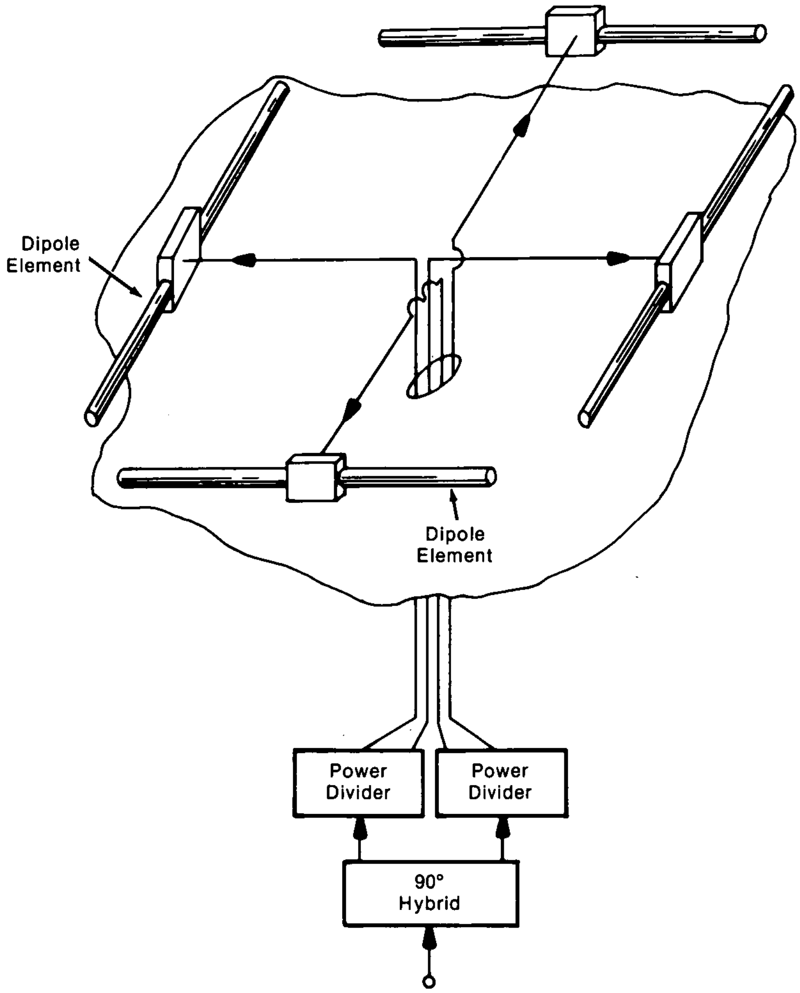


Figure 2. Dipole Configuration

Note:

Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: TSP74-10250

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,680,142). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

Patent Counsel
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103

Source: Lester C. Van Atta
and Robert J. Mailloux
Electronics Research Center
(ERC-10214)

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